**Fuel Cells for Energy Storage**

**Project/Technology Overview**

Our project aims to develop a viable commercialization plan for a novel application of solid oxide fuel cell (SOFC) technology, developed by Prof. Barnett at Northwestern. A fuel cell typically converts an energy stock into electricity. Although useful, the cost of operation does not typically compete with standard, mature generation technologies. Our SOFC reverses this reaction, turning electricity into a fuel stock for later use. At efficient conversion ratios, this technology represents a feasible method to store significant amounts of energy. In contrast to batteries, the storage capacity can be adjusted separately from the power capacity, providing an additional layer of flexibility for the entity deploying the technology.

**Problem/Need**

To keep the electrical grid balanced, power generation has to meet power consumption at all times. Because power consumption varies throughout the day, high-cost, polluting fossil fuel ("peaker") plants have to be fired-up during mere percentages of a 24-hour window, exclusively to satisfy these periods of peak demand. At night, when demand is low, cheap and environmentally friendly wind power is wasted when generators have to be shut down to avoid overvoltage in the grid. This problem will only become increasingly relevant as the share of renewable energy production capacity increases. Even during the day, intermittent production from wind turbines makes it difficult for utilities to reliably meet significant levels of customer demand, creating a disincentive to increase usage of wind power.

**Opportunity**

With our bi-directional fuel cell, we can store excess power generated during periods of off-peak demand and release it to satisfy forecasted peak demand spikes, when the wholesale market price is higher (energy arbitrage). The energy storage component of the SOFC enables its customers to offset use of fossil fuel peaker plants, resulting in lower operational costs and lower CO₂ emissions for utilities. Companies gain the added benefit of a mechanism to reliably integrate an intermittent, but renewable, power source into their generation portfolio to satisfy state RPS requirements.

**Business Model**

We plan to manufacture modular SOFC cells and sell them to utilities throughout the United States. Our revenue stream is based on the sales of our equipment as well as its installation, monitoring, and maintenance.